



UNIVERSITÀ DEGLI STUDI DI TORINO

This is an author version of the contribution published on:

Questa è la versione dell'autore dell'opera:

Aldon, G. & Sabena, C. (2015). Formative assessment in the FaSMEd project: reflections from classroom experiences. In C. Sabena, B. Di Paola (eds.), *Teaching and learning mathematics: resources and obstacles, Proceedings of CIEAEM 67, Quaderni di ricerca didattica*, 25-2 (pp. 83-86). Aosta, July 20-24, 2015. ISSN: 1592-4424.

The definitive version is available at:

La versione definitiva è disponibile alla URL:

http://math.unipa.it/~grim/CIEAEM%2067_Pproceedings_QRDM_Issue%2025_Suppl.2.pdf

Formative assessment in the FaSMEd Project: reflections from classroom experiences

Gilles Aldon*, Cristina Sabena**

*ENS de Lyon

**Dipartimento di Filosofia e scienze dell’educazione, Università di Torino

Mathematical objects can be seen both as *objects* and as *tools* (Douady, 1986). For example, knowing a rotation is both understanding a formal definition of the transformation and its main properties of conservation of distances and angles, but also being able to use a rotation in solving a problem and/or in a proving process. Therefore, assessing the deep understanding of a mathematical object must take into account these different and complementary aspects.

But which kind of assessment do we speak of? The function of different assessments within an institution can be roughly split into two different roles: a role in certification of acquisitions of knowledge or competencies and a role in learning accompanying. The former refers to *summative assessment* and we will not discuss deeply this aspect of assessment here; the latter can be included in the process of *formative assessment* (FA) and appears to be a tool (a resource) for teachers in order to enhance mathematical students' learning. If teaching and learning are driven by summative assessment, the relationship to knowledge and to the learning process risks to be modified: instead of learning for understanding knowledge at stake, learning becomes understanding the way of succeeding in typical tests. Even if summative assessment and exams have a great importance in educational systems, this kind of assessment cannot be considered as a resource for acquiring knowledge. On the contrary, formative assessment can be seen as a resource for teachers and for students in the teaching and learning process.

Our contribution to this Round Table on assessment stems from our joint participation to the FaSMEd Project. FaSMEd (“Improving Progress through Formative Assessment in Science and Mathematics Education”) is a European Project (FPVII, 2013-15) aiming at investigating

the use of technology in formative assessment classroom practices in ways that allow teachers to respond to the emerging needs of low achieving learners in mathematics and science so that they are better motivated in their learning of these important subjects. (FaSMEd Project Document, p. 2)

Three main polarities can be identified within the project, considering the teaching-learning of mathematics and science: (i) formative assessment practices; (ii) the role of technology; (iii) attention to raise attainment, especially of low-achieving students.

Within FaSMEd, we share the definition of *formative assessment* given by Black & Wiliam (2009) on pragmatic basis, according to which

evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited (Black & Wiliam, 2009, p. 7).

This definition takes into account three key processes in learning and teaching (Ramaprasad, 1983):

- Establishing where the learners are in their learning;

- Establishing where they are going;
- Establishing what needs to be done to get them there.

It is also stressed that it is not only the teacher to be responsible for these processes, but the learners, both as individuals and as groups, play a crucial role as well.

Within this view, assessment is no longer considered as an object, but as a process that may change entirely the way teachers are organizing their lessons, and the way learners are managing their learning path.

The table of William & Thompson (2007; the table is in the annex) crosses the fundamental questions of formative assessment and the actors: the teacher, the class and the (generic) student. For example in the first cell of the table, the learning intentions and the criteria of success are pointed out. Overall, five key strategies are identified:

1. “Clarifying and sharing learning intentions and criteria for success;
2. Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding;
3. Providing feedback that moves learners forward;
4. Activating students as instructional resources for one another; and
5. Activating students as the owners of their own learning”. (Black & William, p. 8)

Drawing on two examples from the classroom context, one in France and one in Italy¹, we will now point out the relationships between FA and the mathematical knowledge at stake, and some potentialities of new technologies in the teacher’s hand for formative assessment processes.

The first example (France) relates to a formative lesson about fractions. The teachers begins with a list of mathematical competencies the students have to acquire in the lesson:

- to read and to write a fraction,
- to code and to decode a fraction,
- to give equal fractions,
- to represent a fraction on a numeric line,
- to read a fraction represented on a numeric line,
- to compare a fraction to the unit and to another fraction with the same denominator.

The teacher proposes in the classroom a quiz focusing on these competencies and collects the results using a student response system. In the next lesson, the class results are given individually to the students: for each of these competencies, the students have the representations of their own capabilities using a representation of fractions that corresponds to the “Understanding learning intentions and criteria for success” of the table. The next lesson allows them to write themselves on the sheet their own result and to have a visual representation of their progression. For the teacher, the FA strategy corresponds to the “Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding” because she organised the classroom depending on the success or the difficulty of each student relatively to the targeted competencies.

¹ The French team is formed by Gilles Aldon and Monica Panero. The Italian team is formed by Annalisa Cusi, Francesca Morselli and Cristina Sabena. See also the workshop by these authors in this volume.

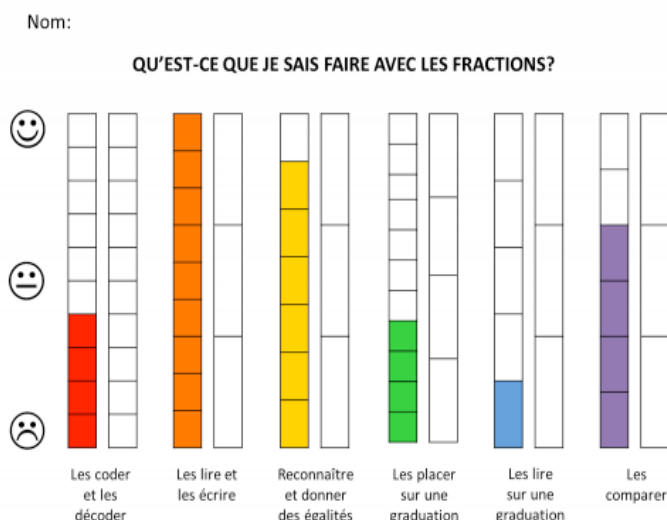


Fig. 1. Representations of a student's capabilities about fractions, using fractions representations.

The second example (Italy) illustrates some potentialities of connected-classroom technologies for formative assessment, when suitably exploited by the teacher as a didactical resource. In a classroom where the students have difficulties in writing their reasoning (IV grade), the use of instant polls has worked as a means for supporting all the students to express their answer, and then explain them during a classroom discussion. For instance, faced with the students' difficulties in correlating formulas to verbal expressions describing a given situation, the teacher shows two different representations (a word sentence like “adding always 5” and a formula, like “ $k=n*7$ ”) and asks: what is written in the formula does correspond to what is written in the text? Three answers are given to choose from: yes, no (correct answer), and I don't know.

Working in pairs with connected tablets, the students give their answers, which are then visualised on a whiteboard and showed through a bar diagram (Fig. 2). The grouped answers allow the teacher to get an immediate grasp on the overall situation of the classroom, so to realize that even with a task considered (by the teacher) relatively simple, some students either failed or did not dare to choose a yes/no answer. At the same time, the bar diagram allows the students to see the answers given by the other classmates, so to get a first feedback on one's own answer (it is or it is not in the main stream).

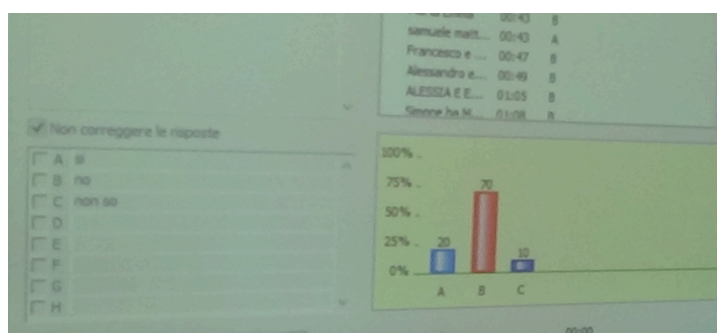


Fig 2. The results of the instant poll on the meaning of text and formula, shared in a whiteboard so to foster discussion

By means of the class discussion (strategy 2, “Engineering effective classroom discussions and other learning tasks that elicit evidence of student understanding”), the students are asked to express their reasoning behind their choice, and this constitutes a first reflective moment for them. Students

may also profit from hearing their mates arguments, and so compare their own reasoning to others' (strategy 4, “Activating students as instructional resources for one another”).

These two short examples illustrate how it is possible to apply the FA framework to give a picture at a certain moment of a technology-based formative assessment lesson and to realize the dynamics that occurs when the teacher and the students become aware of their work.

The last cell of the table crossing the student's viewpoint and the questions “Where the learner is right now?” and “How to get there?” concerns the possibilities to activating students as the owners of their own learning, which can be related to an approach of meta cognition.

Acknowledgements

The research leading to this results has received funding from the European Community's Seventh Framework Programme fp7/2007-2013 under grant agreement No [612337].

REFERENCES

- Black, P., & Williams, D. (2009). Developing the theory of formative assessment. *Educational Assessment, Evaluation and Accountability*, 21(1), 5-31. [n/a]. 10.1007/s11092-008-9068-5.
- Douady, R. (1986). Jeux de cadres et dialectique outil-objet. *Recherches en didactique des mathématiques*, 7(0), 2.
- Ramaprasad, A. (1983). On the definition of feedback. *Behavioral Science*, 28, 4–13.
- Wiliam, D., & Thompson, M. (2007). Integrating assessment with instruction: what will it take to make it work? In C. A. Dwyer (Ed.) *The future of assessment: shaping teaching and learning*, 53-82. Mahwah, NJ: Lawrence Erlbaum Associates.